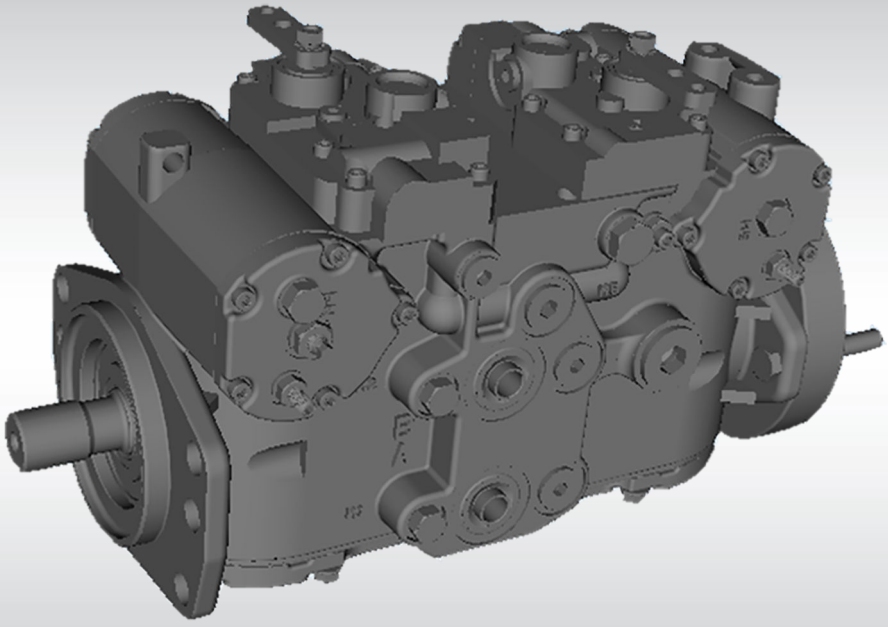
MAKING MODERN LIVING POSSIBLE

Service Manual

Closed Circuit Axial Piston Pumps

Series 42 4T



Revision history

Table of revisions

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Introduction

Overview

This manual includes information for the installation, maintenance, and minor repair of Series 42 axial piston closed circuit pumps. It includes a description of the unit and its individual components, troubleshooting information, and minor repair procedures.

Performing minor repairs requires you remove the unit from the vehicle/machine. Thoroughly clean the unit before beginning maintenance, or repair activities. Since dirt and contamination are the greatest enemies of any type of hydraulic equipment, follow cleanliness requirements strictly. This is especially important when changing the system filter and when removing hoses or plumbing.

A worldwide network of Danfoss Global Service Partners (GSPs) is available for major repairs. Danfoss trains and certifies GSPs on a regular basis. You can locate your nearest GSP using the distributor locator at www.sauer-danfoss.com. Click on the *Sales and Service* link.

Warranty

Performing installation, maintenance, and minor repairs according to the procedures in this manual does not affect your warranty. Major repairs requiring the removal of a unit's rear cover or front flange voids the warranty unless done by a Danfoss global service partner.

General instructions

Follow these general procedures when repairing Series 42 variable displacement closed circuit pumps.

Remove the unit

Prior to performing minor repairs, remove the unit from the vehicle/machine. Chock the wheels on the vehicle or lock the mechanism to inhibit movement. Be aware that hydraulic fluid may be under high pressure and/or hot. Inspect the outside of the pump and fittings for damage. Cap hoses after removal to prevent contamination.

Keep it clean

Cleanliness is a primary means of assuring satisfactory pump life, on either new or repaired units. Clean the outside of the pump thoroughly before disassembly. Take care to avoid contamination of the system ports. Cleaning parts with a clean solvent wash and air drying is usually adequate.

As with any precision equipment, you must keep all parts free of foreign material and chemicals. Protect all exposed sealing surfaces and open cavities from damage and foreign material. If left unattended, cover the pump with a protective layer of plastic.

Replace all O-rings and gaskets

Danfoss recommends replacing all O-rings, gaskets, and seals when servicing. Lightly lubricate all O-rings with clean petroleum jelly prior to assembly.

Secure the unit

Introduction

For repair, place the unit in a stable position with the shaft pointing downward. It is necessary to secure the pump while removing and torquing end covers, controls, and valves.

Safety precautions

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take the following general precautions whenever servicing a hydraulic system.

Unintended machine movement

Warning

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable/disconnect the mechanism while servicing.

Flammable cleaning solvents

Warning

Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

Fluid under pressure

Warning

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.

Personal safety

Warning

Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

Introduction

Symbols used in Danfoss literature

WARNING may result in injury

CAUTION may result in damage to product or property

Reusable part

Non-reusable part, use a new part

Non-removable item

Option - either part may exist

Superseded - parts are not interchangeable

Measurement required

Flatness specification

Parallelism specification

External hex head

Internal hex head

Torx head

O-ring boss port

Tip, helpful suggestion

Lubricate with hydraulic fluid

Apply grease / petroleum jelly

Apply locking compound

Inspect for wear or damage

Clean area or part

Be careful not to scratch or damage

Note correct orientation

Mark orientation for reinstallation

Torque specification

Press in - press fit

Pull out with tool – press fit

Cover splines with installation sleeve

Pressure measurement/gauge location or specification

The symbols above appear in the illustrations and text of this manual. They are intended to communicate helpful information at the point where it is most useful to the reader. In most instances, the appearance of the symbol itself denotes its meaning. The legend above defines each symbol and explains its purpose.

Ordering replacement parts and service

Danfoss provides a complete repair service for its products. Contact any Danfoss Global Service Partner for details.

To ensure the best performance, use genuine Danfoss replacement parts. To order parts, contact Danfoss Extended Customer Service (ECS) at (515) 239-6078, fax (515) 239-6230, or your nearest Global Service Partner.

Some service parts may be available only in kits, while other parts may be available on an individual basis. See publication **520L0589** *Series 42 PV 41cc Service Parts Manual* or **520L0590** *Series 42 PV 28cc Service Parts Manual* for listings of available service parts and service kits for Series 42 units.

General description

Basic design

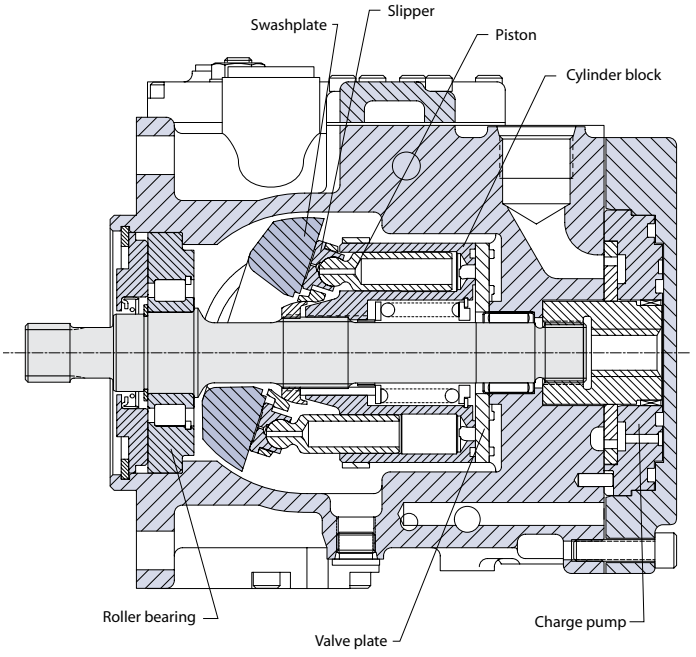
S42 Pumps are advanced hydrostatic units for medium power applications with maximum loads of 415 Bar [6020 psi] (41 cm3) and 350 Bar [5075 psi] (51 cm3). You can combine these pumps with a suitable Danfoss motor or other products in a system to transfer and control hydraulic power.

The Series 42 variable displacement pump is a compact, high power density unit, using the parallel axial piston/slipper concept in conjunction with a tiltable swashplate to vary the pump's displacement..

Reversing the angle of the swashplate reverses the flow of fluid from the pump, and reversing the direction of rotation of the motor output. Series 42 pumps provide an infinitely variable speed range between zero and maximum in both forward and reverse.

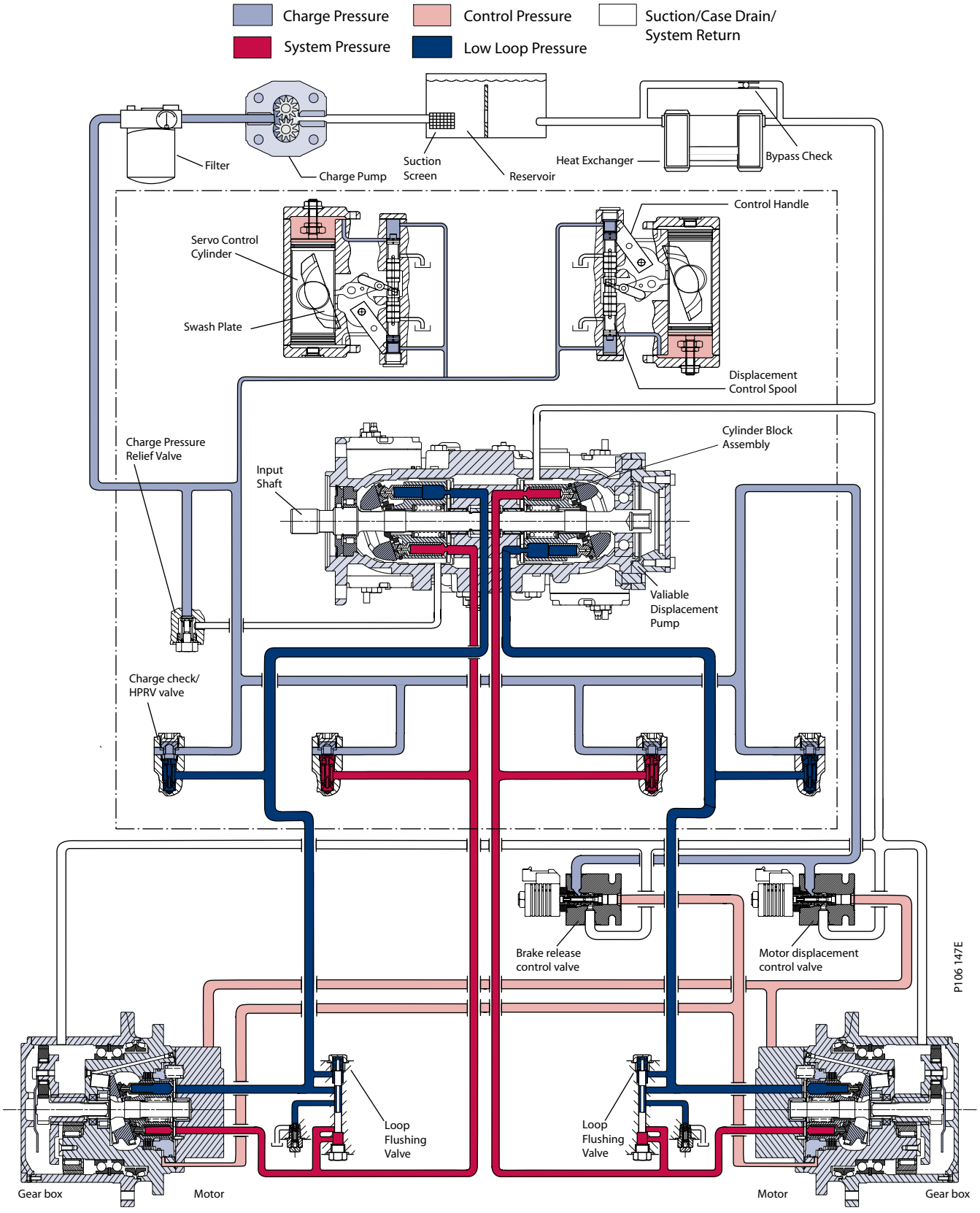
Series 42 pumps use a cradle swashplate design with a hydraulic servo control cylinder. Control is provided through a compact servo control system. A variety of servo controls are available. These include mechanically- or electrically-actuated feedback controls, hydraulic or electric proportional controls, and a three-position electric control. These controls feature low hysteresis and responsive performance.

28/32/41/51 cm^3 cross-sectional view



General description

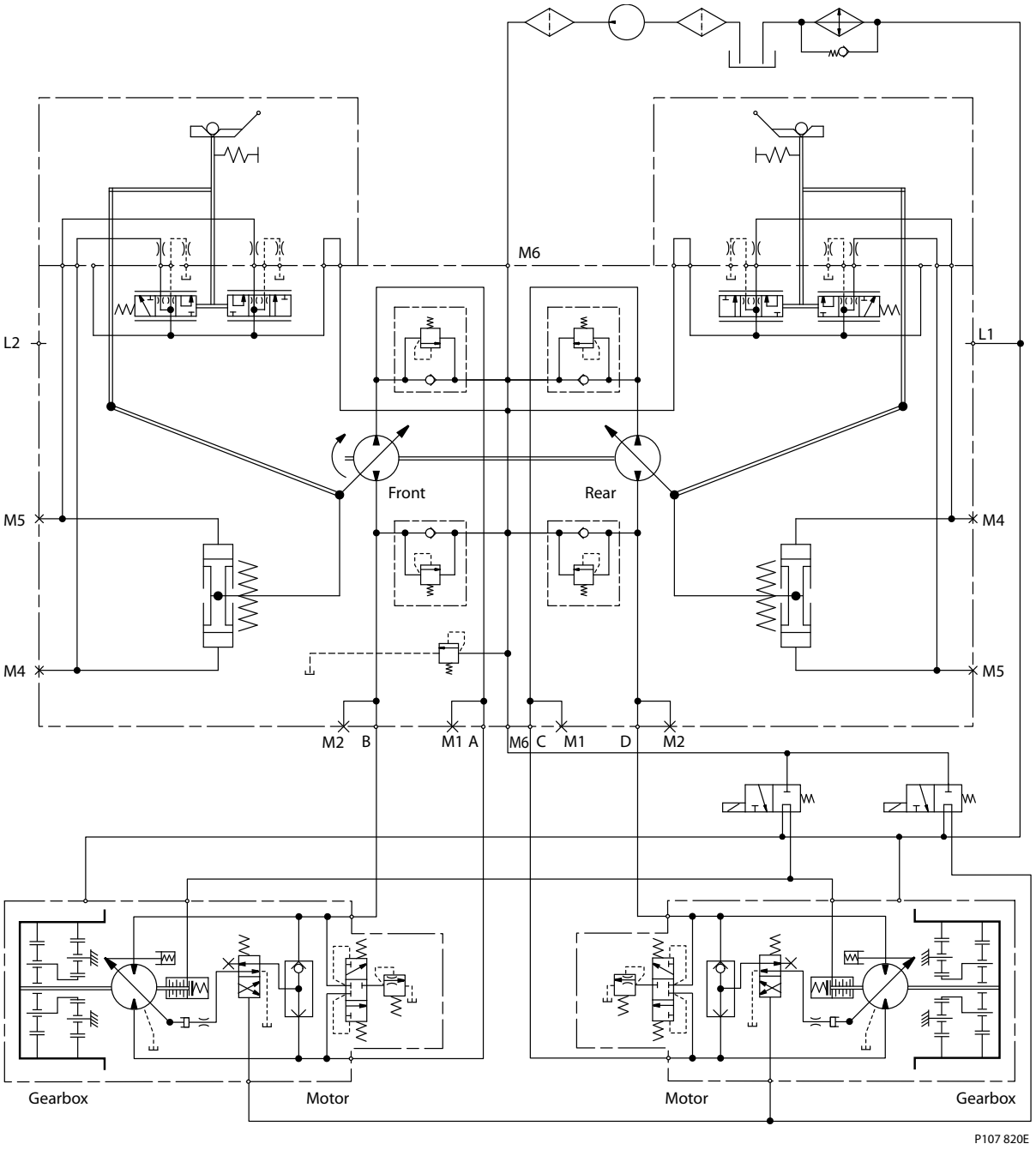
System diagram



General description

System schematic

4T axial piston pump



The illustration above shows a schematic of a 4T axial piston pump. System ports A,C and B,D connect to the high pressure work lines. Return fluid is received from its inlet port and discharged through the outlet port. Flow direction is determined by swashplate position. You can read system port pressure through ports M1 and M2. The pump has two case drains (L1 and L2) to ensure there is lubricating fluid in the system. This schematic includes a manual displacement control. For other control schematics see the related control section.

Technical specifications

System specifications

General specifications

Pump type	In-line, axial piston, positive displacement pumps including cradle swashplate and servo control
Direction of input rotation	Clockwise or counterclockwise
Recommended installation position	Pump installation recommended with control position on the top or side. Consult Danfoss for non conformance guidelines. The housing must always be filled with hydraulic fluid.
Other system requirements	Independent braking system, suitable reservoir and heat exchanger.

Hardware features

Pump configuration	Integrated Tandem Pump	
Displacement cm^3/rev [in^3/rev]	41 [2.50] x 2	51 [3.11] x 2
Weight kgf [lbf]	MDC: 76 [168]	
	NFPH: 72 [158]	
Mass moment of inertia $kg•m^2$ [$lbf•ft^2$]	0.0072 [0.0054]	0.0076 [0.0056]
Type of front mounting flange (SAE flange size per SAE J744)	2 Bolt SAE C, (4 additional bolt holes available)	
Port connections	SAE-twin ports, radial, opposite side ports	
System pressure regulation bar [psi]	210-415 [3045-6020]	210-325 [3045-4715]
Displacement limiters	Option	
Input shaft options	Splined	
Auxiliary mounting pad (SAE pad per SAE J744)	SAE A (9 tooth, 11 tooth, 13 tooth) SAE B (13 tooth)	
Control options	MDC, NFPH, EDC, FNR	
Loop flushing	NONE	

System parameters

Case pressure

Continuous pressure bar [psi]	3.4 [50]
Maximum pressure (cold start) bar [psi]	10.3 [150]

Pressure limits

Displacement cm^3/rev	41	51
Rated pressure bar [psi]	350 [5075]	325 [4713]
Maximum pressure bar [psi]	415 [6017]	350 [5075]

Speed limits

Displacement cm^3/rev	41	51
Minimum speed min^{-1} (rpm)	500	
Rated speed at maximum displacement min^{-1} (rpm)	3200	2900

Technical specifications

Speed limits (continued)

Maximum speed at maximum displacement min^{-1} (rpm)	3450	3400

Charge pump displacement and setting pressure

Charge pump		41	51
Internal cm^3/rev [in^3/rev]	—	none	none
Charge relief valve settings bar [psi]	Standard	20 [290]	
	Optional	14-24 [203-340]	

Theoretical flow

Displacement cm^3/rev	41	51
Theoretical flow at rated speed l/min [US gal/min]	131 [34.6]	148 [39.1]

Check / high pressure relief valve

Options	No relief valve / check only	Relief valve / check
Settings bar [psi]	-	210-415 [3045-6020] or by setting available 210, 250, 280, 300, 325, 345, 360, 385, 415

Hydraulic fluid parameters

Fluid temperature range

Minimum	-40 °C [-40 °F]	Intermittent, cold start
Maximum continuous	104 °C [220 °F]	-
Maximum	115 °C [240 °F]	Intermittent

Fluid cleanliness level

Required fluid cleanliness level	ISO 4406 Class 22/18/13

Fluid viscosity

Minimum	7.0 mm^2/s (cSt)	Intermittent
Recommended operating range	12-60 mm^2/s (cSt)	-
Maximum	1600 mm^2/s (cSt)	Intermittent, cold start

Pressure measurement

Required tools

You can perform the service procedures in this manual using common mechanic's hand-tools. Calibrate gauges frequently to ensure accuracy. Use snubbers to protect pressure gauges.

Port locations and pressure gauge installation

On pumps with non-feedback controls, the positions of the case drains may vary.

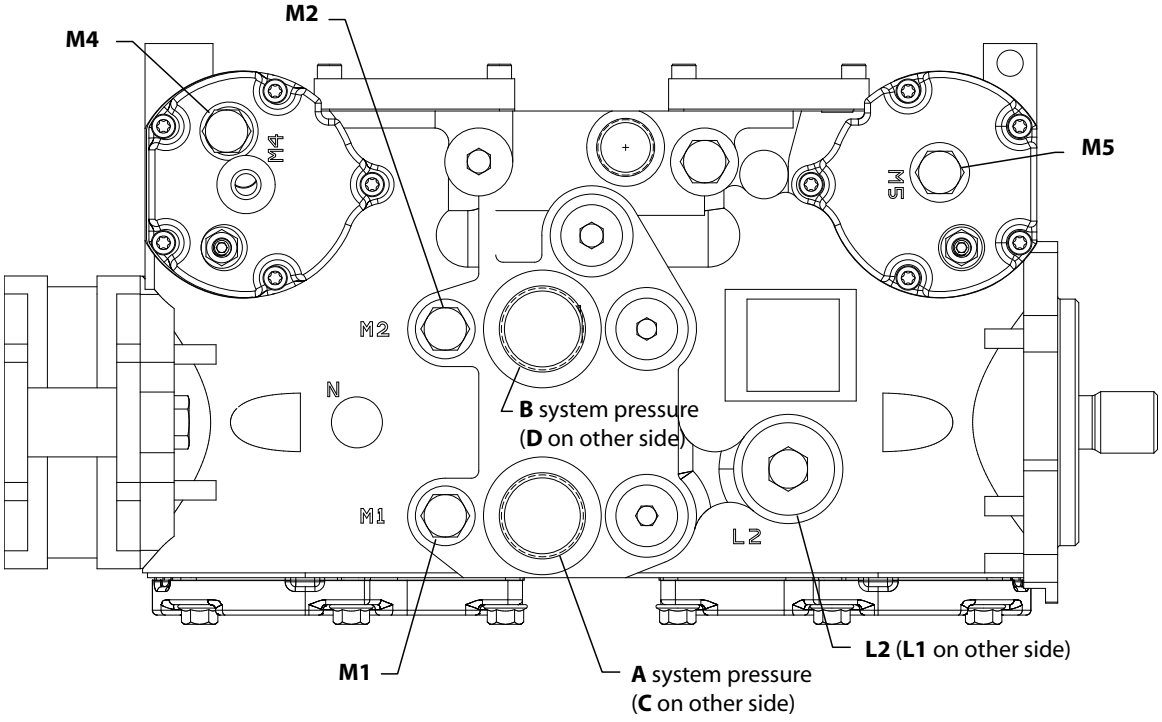
Ports and pressure gauges

Proper service and diagnosis may require pressure measurement at various points in the hydraulic circuit. The Series 42 pump has several locations at which to take these measurements. The following illustration shows the locations of the various gauge ports. The table shows the recommended gauge size and the fitting size for each port.

Gauge ports

Gauge port	Pressure measured	Recommended gauge size	O-ring boss	
			28 cc	41 / 51 cc
M1 & M2	System pressure for ports A and B	600 bar [8700 psi]	9/16/-18	9/16/-18
M4 & M5	Servo pressure	60 bar [870 psi]	9/16-18	9/16-18
L1 & L2	Case pressure	35 bar [510 psi]	1-1/16-12	1-5/16-12

4T gauge ports



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Initial Start-Up Procedure

General

Follow this procedure when starting-up a new Series 42 installation or when restarting an installation in which the pump has been removed.

Warning

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To protect against unintended movement, secure the machine or disable/disconnect the mechanism while servicing.

Prior to installing the pump, inspect for damage incurred during shipping. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

Start-up procedure

1. Connect the pump to the prime mover. Ensure that pump shaft is properly aligned with the shaft of the prime mover.

   Caution

   Incorrect shaft alignment may result in damage to drive shaft, bearings, or seal which can cause external oil leakage.

2. Fill the reservoir with recommended hydraulic fluid. Always filter fluid through a 10 micron absolute filter pouring into the reservoir. Never reuse hydraulic fluid.
3. Fill the main pump housing with clean hydraulic fluid. Pour filtered oil directly into the upper most case drain port.
4. Fill the inlet line leading from the pump to the reservoir. Check the inlet line for properly tightened fittings and be certain it is free of restrictions and air leaks.
5. To ensure the pump stays filled with oil, install the case drain line in the upper most case drain port.
6. Install a gauge at port M2 to monitor system pressure during start up.

   Follow recommendations in the vehicle/machine operator's manual for prime mover start up procedures.

7. While watching the pressure gauge at M2, jog the prime mover or run at the lowest possible speed until system pressure builds to normal levels (minimum 11 bar [160 psi]). Once system pressure is established, increase to full operating speed. If the pump does not maintain system pressure, shut down the prime mover, determine cause, and take corrective action. Refer to *Troubleshooting* on page 16.
8. Operate the hydraulic system for at least fifteen minutes under light load conditions.
9. Check and adjust control settings as necessary after installation. Refer to *Adjustments* on page 19.
10. Shut down the prime mover and remove the pressure gauge. Replace plug at port M2.
11. Check the fluid level in the reservoir; add clean filtered fluid if necessary.

The pump is now ready for operation.

Fluid and Filter Maintenance

Recommendations

To ensure optimum life of Series 42 products, perform regular maintenance of the fluid and filter. Contaminated fluid is the main cause of unit failure. Take care to maintain fluid cleanliness when servicing.

Check the reservoir daily for proper fluid level, the presence of water, and rancid fluid odor. Water in the fluid may be noted by a cloudy or milky appearance or free water in the bottom of the reservoir. Rancid odor indicates the fluid has been exposed to excessive heat. Change the fluid immediately if these conditions occur. Correct the problem immediately.

Change the fluid and filter per the vehicle/machine manufacturer's recommendations or at these intervals:

Change the fluid more frequently if it becomes contaminated with foreign matter (dirt, water, grease, etc.) or if the fluid is subjected to temperature levels greater that the recommended maximum.

Dispose of used hydraulic fluid properly. Never reuse hydraulic fluid.

Change filters whenever the fluid is changed or when the filter indicator shows that it is necessary to change the filter. Replace all fluid lost during filter change.

Fluid and filter change intervals

Sealed reservoir	2000 hours
Breather reservoir	500 hours

Troubleshooting

Overview

This section provides general steps to follow if you observe certain undesirable system conditions. Some of the items are system specific. Always observe the safety precautions listed in the introduction of this manual. If standard troubleshooting procedures do not remedy the problem, contact a Danfoss Global Service Partner.

System operating hot

Item	Description	Action
Oil level in reservoir	Insufficient hydraulic fluid will not meet the cooling demands of system.	Fill the reservoir to the proper level with clean hydraulic oil.
Heat exchanger (if equipped)	The heat exchanger is not sufficiently cooling the system.	Check the air flow and input air temperature for the heat exchanger. Clean, repair, or replace the heat exchanger as necessary.
Bypass valve	A partially activated bypass valve may result in heat generation within the system.	Verify that the bypass valve is fully closed and that the valve is seating properly. Repair or replace it as necessary.
SCR (System Check / Relief) Valves	A partially activated SCR valve or SCR valves with relief settings too low may result in heat generation within the system.	Verify that the SCR valve is seating properly and is at the correct relief setting. Repair or replace it as necessary.
Oil filters	Clogged oil filters may result in an insufficient supply of cool oil to the system.	Inspect the oil filters and verify that they are still operable. Replace them if necessary.
Machine load	Excessive loads or extreme duty cycles could result in the pump and/ or motor operating at speeds and pressures beyond system design limitations.	Verify that the machine is operating within the parameters for which it was designed. If necessary, reduce the load on the machine.

System response is sluggish

Item	Description	Action
Reservoir oil level	There is an insufficient amount of hydraulic fluid, resulting in an inadequate supply for the system loop.	Fill the reservoir to the proper level with clean hydraulic fluid.
Input control signal (linkage, current, or pressure)	The pump is receiving a faulty control signal: (MDC - binding or broken linkage; EDC - faulty or inadequate electrical signal; HDC - blocked or incorrectly orificed control lines).	Verify that the input signal is correct and identical in both directions.
Pump control	A damaged pump control or control spool will not correctly transmit the control input signal to the pump.	Verify that the pump's control is operating properly and that the control spool is not damaged or worn and moves freely within its bore. Clean, repair, or replace it as necessary.
Bypass valve	A partially activated bypass valve will cause cross port leakage.	Verify that the bypass valve is closed and that the valve is seating properly. Clean, repair, or replace it as necessary.
SCR (system check / relief) valves	One or both of the SCR valves may be binding within their bores.	Verify that the SCR valves operate freely. Repair or replace them as necessary.
Charge pressure (in neutral)	Low charge pressure resulting from a damaged charge pump or low charge pressure relief valve setting. Charge pressure may be insufficient to recharge the system loop.	Inspect the charge pump for damage and verify the charge pressure relief valve setting. Repair or replace it as necessary.
Charge pressure (in stroke)	There is low charge pressure resulting from internal leakage within the system.	Repair or replace the component or components within the system causing the internal leakage.

Troubleshooting

Item	Description	Action
Servo pressure	There is insufficient pressure differential across the servo piston.	Check servo pressures at port M4 and M5 to verify sufficient pressure delta. Verify that the servo supply and drain paths are unobstructed and that any orifices are of the correct size and free of debris. Clean, repair, or replace as necessary.
Charge pump	The charge pump has been damaged or installed with the incorrect rotational orientation.	Verify that the charge pump is in good working order and that it is correctly installed. Repair or replace it as necessary.

System will not operate in either direction

Item	Description	Action
Oil level in reservoir	There is an insufficient amount of hydraulic fluid, resulting in an inadequate supply for the system loop.	Fill the reservoir to the proper level with clean hydraulic oil.
Input control signal (linkage, current, or pressure)	The pump is receiving a faulty control signal: (MDC - binding or broken linkage; EDC - faulty or inadequate electrical signal; HDC - blocked or incorrectly orificed control lines).	Verify that the input signal is correct and identical in both directions. Adjust, clean, repair, or replace the input device as necessary.
Oil filters	Clogged oil filters may result in an insufficient supply of oil to the system.	Inspect the oil filters and verify that they are still serviceable. Replace them as necessary.
Bypass valve	A partially activated bypass valve may result in a cross port leakage.	Verify that the bypass valves are closed and that the valves are seating properly. Clean, repair, or replace them as necessary.
Charge pressure (in neutral)	Charge pressure may be insufficient to recharge the system loop.	Inspect the charge pump for damage and verify that the charge pressure relief valve is at the proper setting. Repair or replace it as necessary.
Charge pressure (in stroke)	Low charge pressure resulting from internal leakage within the system.	Repair or replace the component or components within the system causing the internal leakage.
Servo pressure	There is an insufficient pressure differential across the servo piston.	Check servo pressures to verify sufficient pressure delta. Verify that the servo supply and drain paths are unobstructed and that any orifices are of the correct size and free of debris. Clean, repair, or replace them as necessary.
Charge pump	The charge pump is damaged or has been installed with the incorrect rotational orientation.	Verify that the charge pump is in good working order and that it is correctly installed. Repair or replace it as necessary.
SCR (system check / relief) valves	The SCR valves are malfunctioning or improperly set.	Verify that the SCR valves are operating and properly set. Repair or replace them as necessary.
Displacement limiters	The displacement limiters may be improperly adjusted such that the servo piston is prevented from moving in one direction.	Verify that the displacement limiters are adjusted to the proper setting.

System will not operate in one direction

Item	Description	Action
Input control signal (linkage, current, or pressure)	The pump is receiving a faulty control signal: (MDC - binding or broken linkage; EDC - faulty or inadequate electrical signal; HDC - blocked or incorrectly orificed control lines).	Verify that the input signal is correct and identical in both directions. Adjust, clean, repair, or replace the control module as necessary.
SCR (System Check/Relief) valves	The SCR valves are malfunctioning or improperly set.	Verify that the SCR valves are operating properly. Repair or replace them as necessary.

Troubleshooting

Item	Description	Action
Pump control	A damaged or biased pump control may be sending a signal commanding the pump to stroke only in one direction.	Verify that the pump's control is functioning properly. Repair or replace it as necessary.
Servo pressure	The drain or supply path to one side of the servo piston may be blocked.	Verify that the servo supply and drain paths are unobstructed and that any orifices are of the correct size and free of debris. Clean or repair them as necessary.
Displacement limiters (if equipped)	The displacement limiters may be improperly adjusted such that the servo piston is prevented from moving in one direction.	Verify that the displacement limiters are adjusted properly.

Neutral difficult or impossible to find

Item	Description	Action
Input control signal (linkage, current, or pressure)	The pump is receiving a faulty control signal: (MDC - binding or broken linkage; EDC - faulty or inadequate electrical signal; HDC - blocked or incorrectly orificed control lines).	Verify that the input signal is correct and identical in both directions. Adjust, clean, repair, or replace control module as necessary.
System pressure	With no input signal to the control, a pressure delta may exist between the two sides of the working loop.	Readjust pump neutral setting. Refer to *Pump neutral adjustment* on page 21.
Servo pressure	With no input signal to the control, a pressure delta may exist across the servo piston.	Readjust the control neutral setting. Refer to *Control neutral adjustment for MDC and EDC* on page 22.
PCP pressure (EDCs only)	With no input signal to the control, a pressure difference may exist across the control spool.	Replace the EDC.

Adjustments

Overview

This section offers instruction on how to perform adjustments to the Series 42 pump. Read through the entire procedure before beginning any service activity. Refer to *Port locations and pressure gauge installation* on page 13 for location of gauge ports and suggested gauge size.

Displacement limiter adjustment

You may adjust displacement limiters to achieve a desired maximum flow rate. For Series 42 pumps, displacement limiters are available on one or both sides of the servo piston.

Accurate adjustment of the displacement limiters requires the use of a test stand capable of measuring system flow output from both the A and B output ports.

1. Mount the pump onto the test stand.
2. Loosen the displacement limiter seal lock nut (L025), but do not remove it.
3. Start the prime mover and place the pump into full stroke in one direction. Note the system output flow from either the A or B system port.
4. Adjust the displacement limiter adjustment screw (L020) until the desired output flow is reached. Turning the displacement limiter adjustment screw clockwise decreases the maximum output flow setting. Turning the displacement limiter adjustment screw counter clockwise increases the maximum output flow setting.

   Warning

   WARNING

   The seal nut lock nut must be retorqued after every adjustment and the limiter screw must have full thread engagement in the servo piston cover to prevent unexpected changes in operating conditions and to prevent external leakage during unit operation.

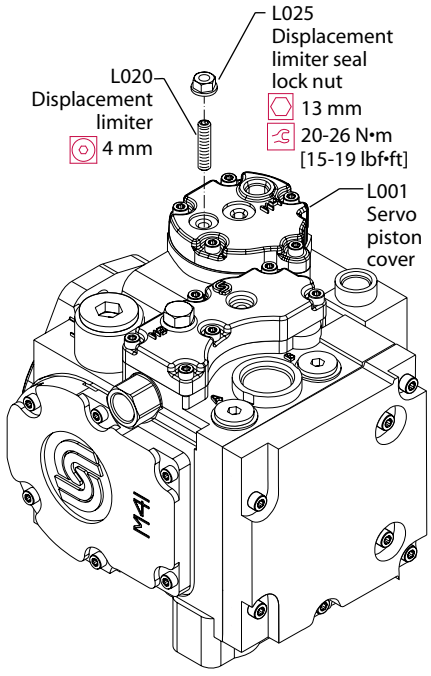
   The pump achieves maximum flow when the displacement limiter does not contact the servo piston while the unit is in full stroke. One full turn of the displacement limiter adjustment screw results in approximate flow output changes per the table.

5. Once you achieve the proper output flow, torque the displacement limiter seal lock nut (L025) to 20-26 N•m [15-19 lbf•ft] while holding the position of the adjustment screw (L020).

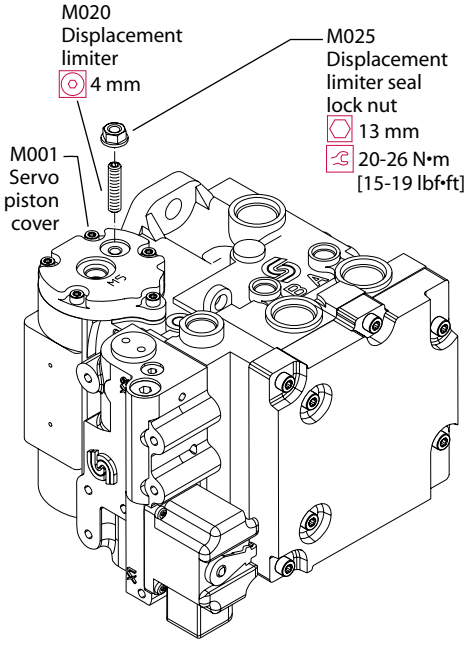
Adjustments

6. If required, repeat this procedure using the opposite displacement limiter to set the output flow in the other direction.

Displacement limiters



RIGHT SIDE VIEW (M4)



LEFT SIDE VIEW (M5)

Displacement limiter adjustment

Size	Displacement change per turn
41 cm^3	5.0 cm^3/rev [.31 in^3/rev]

Adjustments

Conversions

Changes to the displacement limiter settings are conversions to the pump. Change the nomenclature on the specification tag to reflect the alterations of the unit. Refer to **520L0637** *Series 42 Technical Information Manual, Model Code Supplement*, or contact your Danfoss representative for the appropriate nomenclature.

Pump neutral adjustment

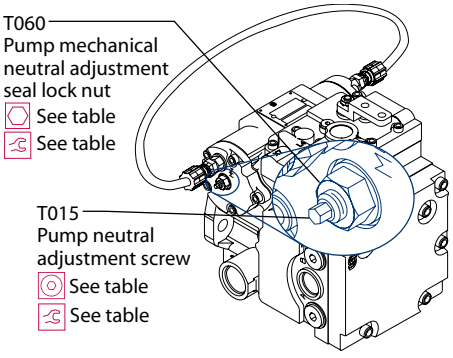
Zero output flow from the pump defines the neutral condition. To attain zero output flow, the pump must achieve both mechanical neutral and control neutral conditions. Mechanical neutral is the condition when the swashplate is at zero angle without any signal input from the control. Set mechanical neutral prior to setting control neutral.

Warning

To prevent injury, disable the machine: raise wheels off the ground or disconnect the mechanism..

1. Disable the control input to the pump by equalizing the pressures on both ends of the pump servo piston. To accomplish this, connect an SAE-06 hose between servo gauge ports, M4 and M5.
2. Install pressure gauges in gauge ports M1 and M2 to measure system pressure.
3. Start the prime mover and run at normal operating speed.
4. Loosen the pump neutral adjustment seal lock nut (T060) in the center of the servo cover on the right side of the pump.
5. Turn the adjustment screw (T015) clockwise until one of the gauges registers an increase in system pressure. Mark the position of the adjustment screw. Turn the screw counterclockwise until the other gauge registers an increase in system pressure. Mark the position of the adjustment screw. Turn the adjustment screw clockwise to a position halfway between the marks. The system pressure gauges should indicate equal pressures.
6. While holding the adjustment screw in position, torque the seal lock nut (T060). Torque to 31-50 N•m [23-37 lbf•ft].
7. Stop the prime mover and remove the hose between gauge ports M4 and M5. Remove the pressure gauges in gauge ports M1 and M2. Reinstall the plugs in the gauge ports.
8. Proceed to the control neutral adjustment section on the next page.

Pump neutral adjustment screw

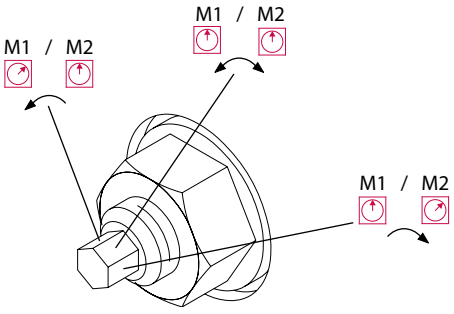


E100002E

MDC Shown

Adjustments

Neutral adjustment gauge port readings



P101259

Frame size cm^3	41/51	
Control	MDC/EDC	NFP
Lock nut mm	17	17
Servo adjust screw mm [in]	7	7
Lock nut torque N•m [lbf•ft]	31-50 [23-37]	31-50 [23-37]

Control neutral adjustment for MDC and EDC

Control neutral adjustment aligns the pump swashplate and the control spool so that a zero angle control setting provides a zero degree swashplate setting. Perform this adjustment whenever you adjust or move any part of the control or swashplate mechanism or after you adjust the pump neutral setting.

Warning

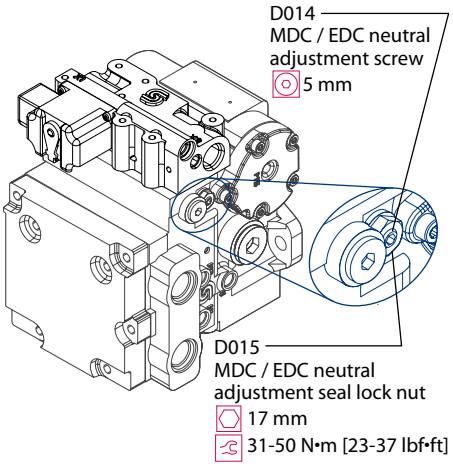
The following procedure requires the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders.

1. Disconnect the external control linkage (for MDC) or control signal input (for EDC) from the pump.
2. Install pressure gauges in the servo gauge ports M4 and M5 to measure pressure on the pump servo piston.
3. Start the prime mover and run at normal operating speed.
4. Loosen the control neutral adjustment seal lock nut (D015).
5. Turn the adjustment screw (D014) clockwise until one of the gauges registers an increase in pressure on the servo piston. Mark the position of the adjustment screw. Turn the screw counterclockwise until the other gauge registers an increase in pressure on the servo piston. Mark the position of the adjustment screw. Turn the adjustment screw clockwise so that it is midway between the marks. Adjustment screw movement produces constant change for both directions, so both the pressure gauges should indicate nearly equal pressures.
6. While holding the adjustment screw (D014) in position, torque the seal lock nut (D015) to 31-50 N•m [23-37 lbf•ft].
7. Stop the prime mover and remove the pressure gauges. Remove the plugs in the gauge ports.

Adjustments

8. Connect the external control linkage (for MDC) or control signal input (for EDC) to the pump. Reconnect the work function.

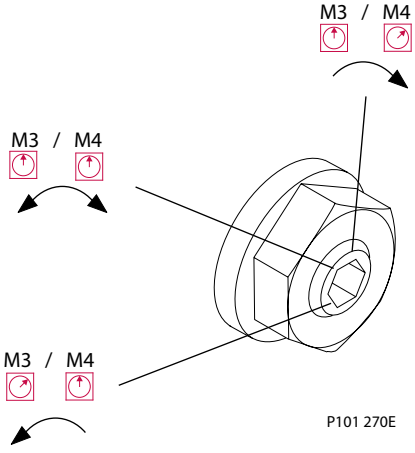
Control neutral adjustment screw



E100003E

EDC Shown

Equalization of pressure gauges using pump neutral adjustment screw



Minor repair

Standard procedures

Remove the pump

Prior to performing certain minor repairs on the Series 42 pump, it may be necessary to remove the pump from the machine. Chock wheels of vehicle to prohibit movement. Be aware that hydraulic fluid may be under high pressure and may be hot. Inspect the outside of the pump and fittings for damage.

Keep it clean

Cleanliness is a primary means of assuring satisfactory pump life, on either new or repaired units. Clean the outside of the pump thoroughly before disassembly. Take care to avoid contamination of the system ports. Clean parts using a clean solvent wash and air dry.

As with any precision equipment, keep all parts free of foreign materials and chemicals. Protect all exposed sealing surfaces and open cavities from damage and foreign material. If left unattended, cover the pump with a protective layer of plastic.

Inspect for system contamination

Inspect the pump for system contamination. If you find contamination, fully disassemble, clean, and inspect all components of the pump. Pump warranty will be voided unless disassembly and rebuild are performed by a Danfoss Global Service Provider.

Replace the O-rings and gaskets

Danfoss recommends you replace all O-rings and gaskets. Lightly lubricate O-rings with clean petroleum jelly prior to assembly.

Lubricate all moving parts

During reassembly, coat all moving parts with a film of clean hydraulic oil. This will help to lubricate these parts during start-up. For fluid quality requirements, refer to bulletin **520L0463** *Hydraulic Fluids and Lubricants, Technical Information*.

EDC Spool, linkage, and neutral adjustment screw

It may be necessary to remove the control spool, control linkage, and control neutral adjustment screw for cleaning and to change the O-rings or the seal lock nut.

Removal

1. Clean the external surface of the pump.
2. Use a T30 Torx to remove the screws (D002). Remove control modules from pump. Remove and discard gaskets (E011).

   Note control linkage assemblies, and the way the summing links engage the control spool flats.
3. Remove the summing links (D011) by sliding them off the feedback link. Using a 4mm internal hex wrench, remove the summing link pivot pin (D010). Slide the feedback link (D012) towards the servo piston to disengage the neutral adjustment link (D013). Remove all linkages.
4. Remove plugs (D032). Note the orientation of the control spools (D90) and which side of the pump the springs (D91) are located. Remove control spools, washers and springs.
5. Remove the seal nuts (D015) and neutral adjustment screws (D014). Note position of adjustment screws for reassembly.

Minor repair

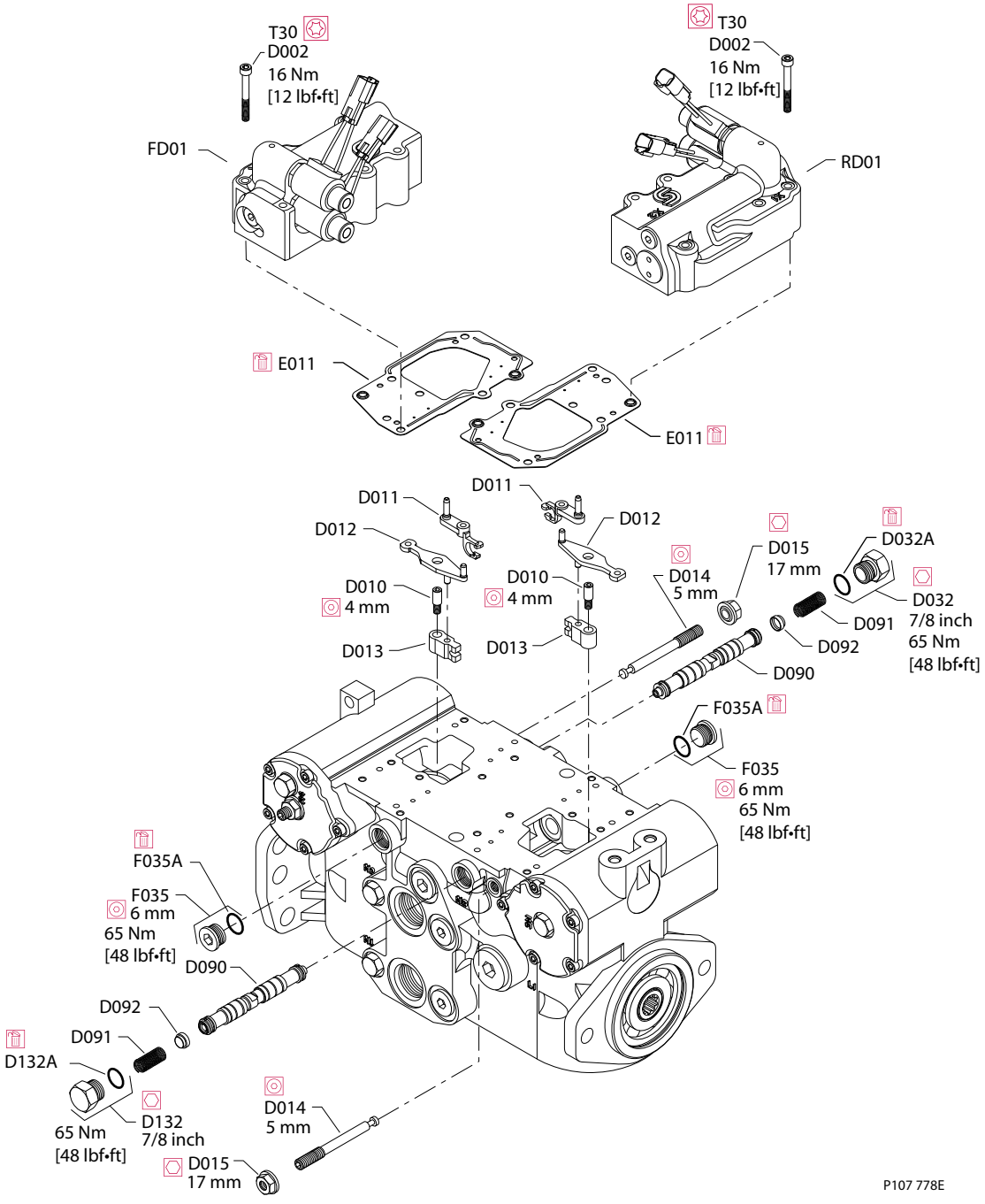
Installation

1. Install adjustment screws (D014) to position previously noted. Install lock nuts (D015). Do not tighten the nuts. After pump is installed on machine, refer to *Control neutral adjustment for MDC and EDC* on page 22 for control neutral adjustment procedure.
2. Lubricate and install spools (D90), washers (D92) and springs (D91), noting proper orientation. Install the two side bore plugs and torque to 65 N•m [48 lbf•ft].
3. Combine the center pin of the feedback links (D012) with the mating bore of the neutral adjustment links (D013). Insert the end of the feedback links into the servo piston slots. Mate the neutral adjustment links with the control neutral adjustment screws (D014). Insert the linkage pivot screws (D010) and torque to 12 N•m [9 lbf•ft]. Install the summing links (D011). It may be necessary to rotate the control spools so that the summing link forks engage the flats on the control spools.
4. Install new gaskets (E011). Install controls.

Minor repair

5. Install screws (D002). Torque to 16 Nm [12 lbf•ft].

MDC / EDC spool and linkage



FNR controls

FNR controls are non-feedback type controls. The FNR controls consist of external, solenoid-actuated spool valves mounted on the pump housing.

It may be necessary to remove the FNR controls to clean the ports and replace the O-rings, however the controls themselves are not serviceable.

Minor repair

Removal of FNR modules

1. Clean the pump and control housings.
2. Use a 4 mm internal hex to remove screws (D081). Remove the control modules from the pump housing.
3. Remove and discard the O-rings (FD01A) from the control ports. Examine the ports for cleanliness.
4. Use a 4 mm internal hex to remove screws (D180). Remove plates (D043) and (D143).
5. Remove and discard gaskets (D044).
6. If necessary, remove plugs (D032) and (F035). Remove and discard O-rings (D035A) and (D032A).

   The spools are solid; other than plugging the bores, they do not provide any function.
7. Unless leaking fluid, adjusting screws (D014) and lock nuts (D015) do not need to be removed.

   Other than plugging the bores, adjusting screws do not provide any function.

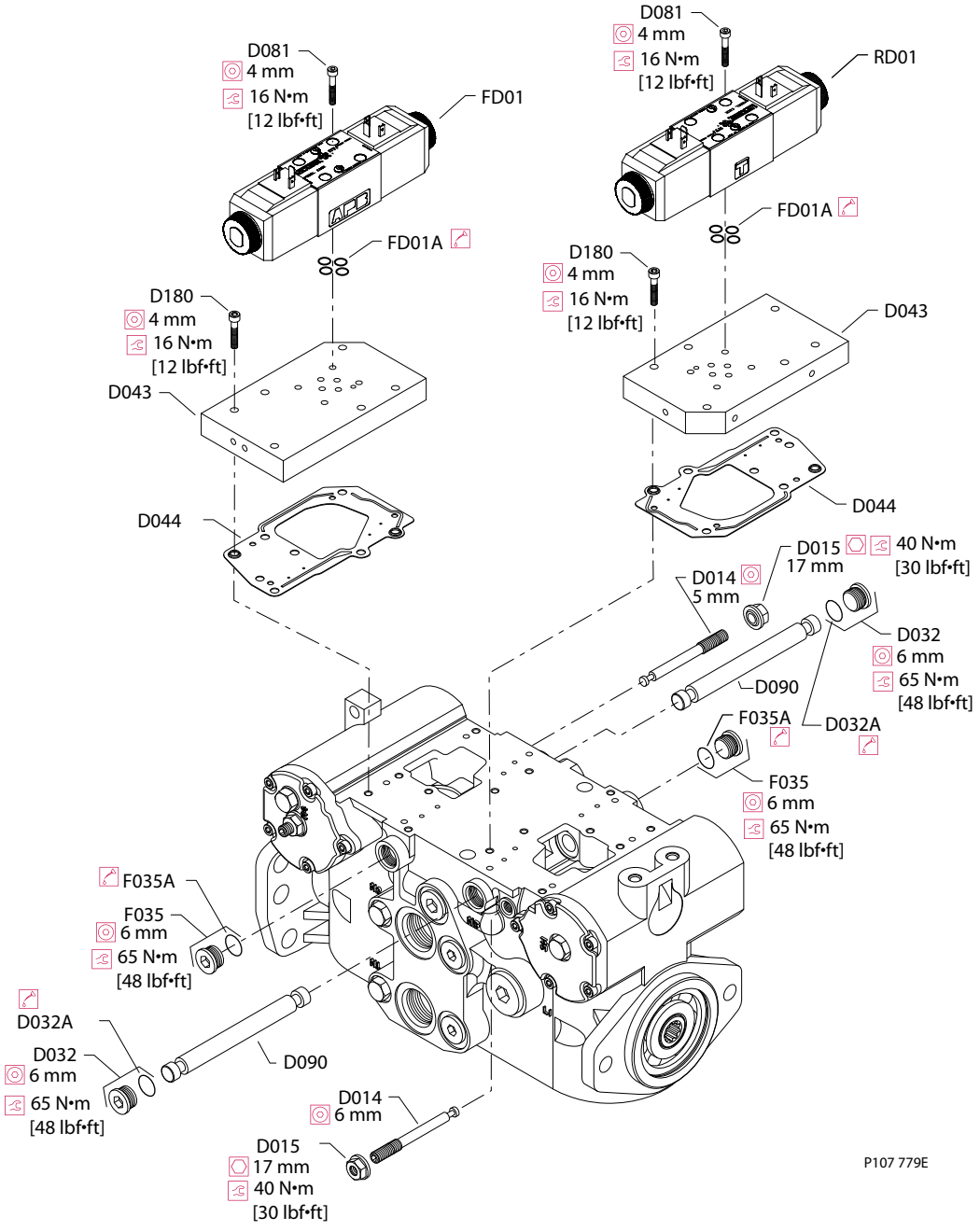
Installation of FNR modules

1. If previously removed, install spools (D090). Lubricate and install new O-rings (D032A), and (F035A). Install plugs (D032) and (F035). Torque to 65 Nm [48 lbf•ft].
2. If previously removed, install adjusting screws (D014) and locknuts (D015). Torque locknuts to 40 Nm [30 lbf•ft].
3. Clean the sealing surfaces on the controls and housing.
4. Install gaskets (D044). Install plates (D043) and (D143). Use a 4 mm internal hex to install screws (D180). Torque to 16 Nm [12 lbf•ft].
5. Using petroleum jelly, lubricate and install O-rings (FD01A) to bottom of controls.

Minor repair

6. Install control modules. Use a 4 mm internal hex, install screws (D081). Torque to 16 N•m [12 lbf•ft].

FNR Minor Repair



System Check Relief (SCR) valves)

The System Check Relief valve assembly performs the charge check, high pressure relief, and loop bypass functions. You may remove this assembly for cleaning and replacement of O-rings.

Removal

1. Using a 1 inch wrench or an 8 mm internal hex, remove the valve seat plugs (K001) from the pump housing. Remove and discard the O-rings and backup rings (K008, K009, and K010).

Minor repair

2. Remove the SCR valve assemblies (H005/J005).

If SCR valve does not have a bypass plunger, skip steps 3 and 4.

3. Use a snap ring pliers to remove retaining ring (K005).
4. Remove bypass plunger (K002) and O-rings (K006). Discard O-rings.

Inspection

Inspect the valves and mating seats in the valve seat plugs (K001) for damage or foreign material.

The SCR valves (H005/J005) are not serviceable; replace as a complete unit.

Replacement

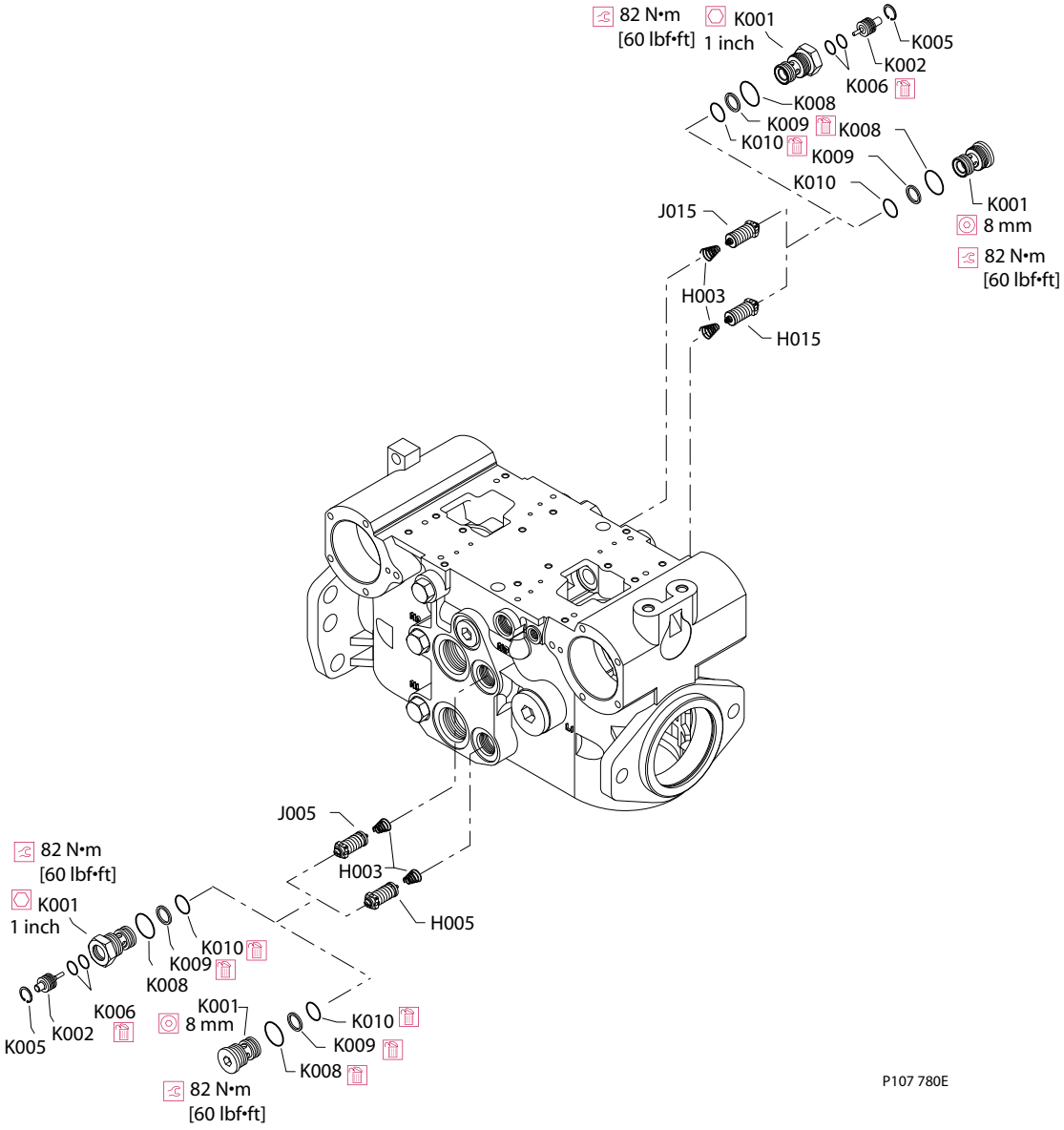
If SCR valve does not have a bypass plunger, skip steps 6 and 7.

1. Lubricate and install O-rings (K006) onto bypass plunger.
2. Install bypass plunger (K002). Install snap ring (K005).
3. Install new outer O-ring (K008), backup ring (K009), and inner O-ring (K010) on each valve seat plug.
4. Verify that the conical springs are properly retained on the check poppets/relief valves (H005/J005). Install the check poppet/relief valve assemblies into the pump housing. Ensure that the valve assembly moves freely in its bore.

Minor repair

5. Using a 1 inch wrench or an 8 mm internal hex, install the valve seat plugs or valve seat/bypass plugs into the pump housing and torque to 82 N•m [60 lbf•ft].

System check relief valve components



Servo piston covers and NFPH control orifices

You can remove the servo piston covers to replace the gasket or to clean or replace the NFPH control orifices.

Disassembly

1. Use a 13 mm or 17 mm wrench to remove locknuts (T060).

Minor repair

2. Using a T-30 Torx, remove the servo cover screws (L005/M005).

Warning

Unintended vehicle movement hazard: When you remove the right side servo piston cover, adjust neutral and control neutral after reinstalling the pump. Refer to *Pump neutral adjustment* on page 21 and *Control neutral adjustment for MDC and EDC* on page 22.

3. Remove servo piston covers (L001/M001).

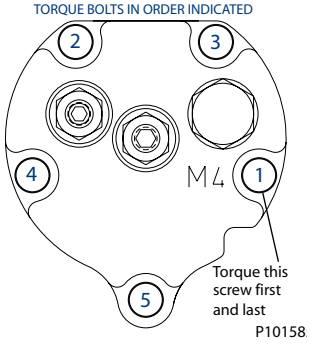
To remove the right side servo cover turn the neutral adjusting screws (T015)clockwise until cover can be turned off without interference from housing.

4. Remove gaskets (F009). Clean gasket sealing surfaces.
5. If so equipped, NFPH orifice plugs (E051 and E052) are located beneath the servo covers. If necessary, use a 3 mm internal hex to remove the orifices and clean them.

Assembly

1. If previously removed, replace the NFPH orifice plugs (E051, E052). Torque to 2-4 Nm [1.5-3 lbf•ft].
2. Install new gaskets (L002/M002).
3. On the right side, thread the servo piston cover (L001) onto the neutral adjustment screw. Then, while holding the cover, turn the neutral adjustment screw (T015) counter-clockwise to run the cover down the screw threads.
4. Using a T30 Torx driver, install the servo piston cover screws (L005/M005). Torque to 16 N•m [12 lbf•ft] in the pattern shown.

Bolt torque pattern



5. Use an 8 mm wrench to secure neutral adjusting screw. Install a new seal lock nut (T060) onto the neutral adjustment screw (T015). Do not torque at this time.
6. Perform pump neutral adjustment and control neutral adjustment procedures. Refer to *Control neutral adjustment for MDC and EDC* on page 22.

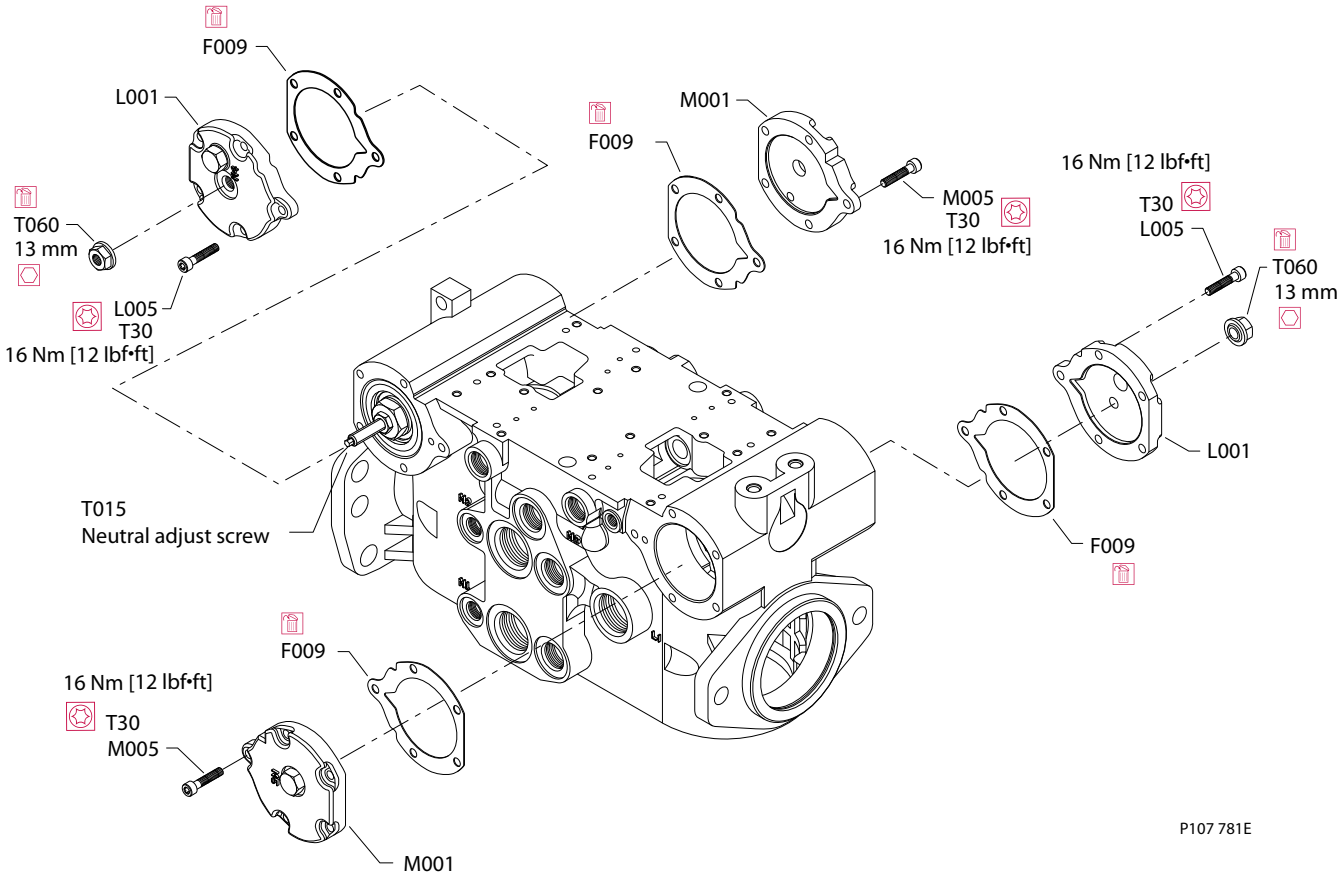
Removal of the servo covers may change the position of optional displacement limiters; readjust if necessary (see *Displacement limiter adjustment* on page 19).

Wrench size for locknut (T060) and neutral adjust screw (T015)

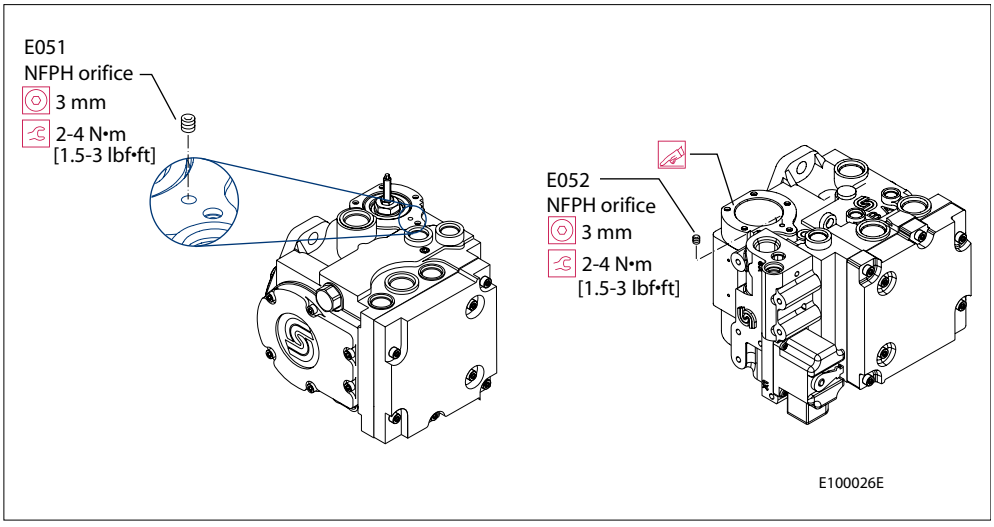
Frame size cm³	**41/51**	
Control	MDC/EDC	NFPE/NFPH
Lock nut (T060)	17 mm	17 mm
Neutral adjust screw (T015)	7 mm	7 mm

Minor repair

Servo piston covers



Removing NFPH orifices - single pumps shown



Shafts

Orient housing so shaft to be replaced is on top. Do not move the pump until the shaft has been replace.

Minor repair

Remove rear shaft

1. Remove retaining ring (C012). Remove bearing (C009).
2. Pull shaft (C006) from housing. If necessary, use a snap ring pliers to pull shaft.

Caution

Do not damage machined surfaces of pump when removing shaft.

Remove front shaft (with seal carrier)

1. Remove retaining ring (F096). Remove shaft seal carrier (C020).
2. Remove shaft seal carrier (C020). Remove and discard O-ring (C017).
3. Press seal out of carrier and discard it.
4. Remove shaft with bearing from housing.
5. If replacing bearing, use a snap-ring pliers to remove retaining ring (C002 or C010). Remove roller bearing (C003 or C008).

Remove front shaft (without seal carrier)

1. Remove shaft with bearing from housing.
2. If replacing bearing, use a snap-ring pliers to remove retaining ring (C010). Remove roller bearing (C008).

Inspect shafts

Check to see that the shaft and its splines are straight and free of damage or heavy wear. Inspect the shaft sealing surface. Replace the shaft if a groove exists at the sealing land. Clean the sealing area with a nonabrasive material.

Install rear shaft

1. Lubricate and install bearing (C009) onto shaft (U001).
2. Install shaft with bearing into housing. Install retaining ring (C012).

Caution

Do not damage machined surfaces of pump when removing shaft.

Install front shaft (with seal carrier)

1. Lubricate and install bearing (C003) onto shaft.
2. Use a snap ring pliers to install retaining ring (C002). Install shaft with bearing into housing.
3. Lubricate and install seal (C018) into seal carrier (C020). Lubricate and install O-ring (C017).
4. Install seal carrier into housing. Install retaining ring (F096).

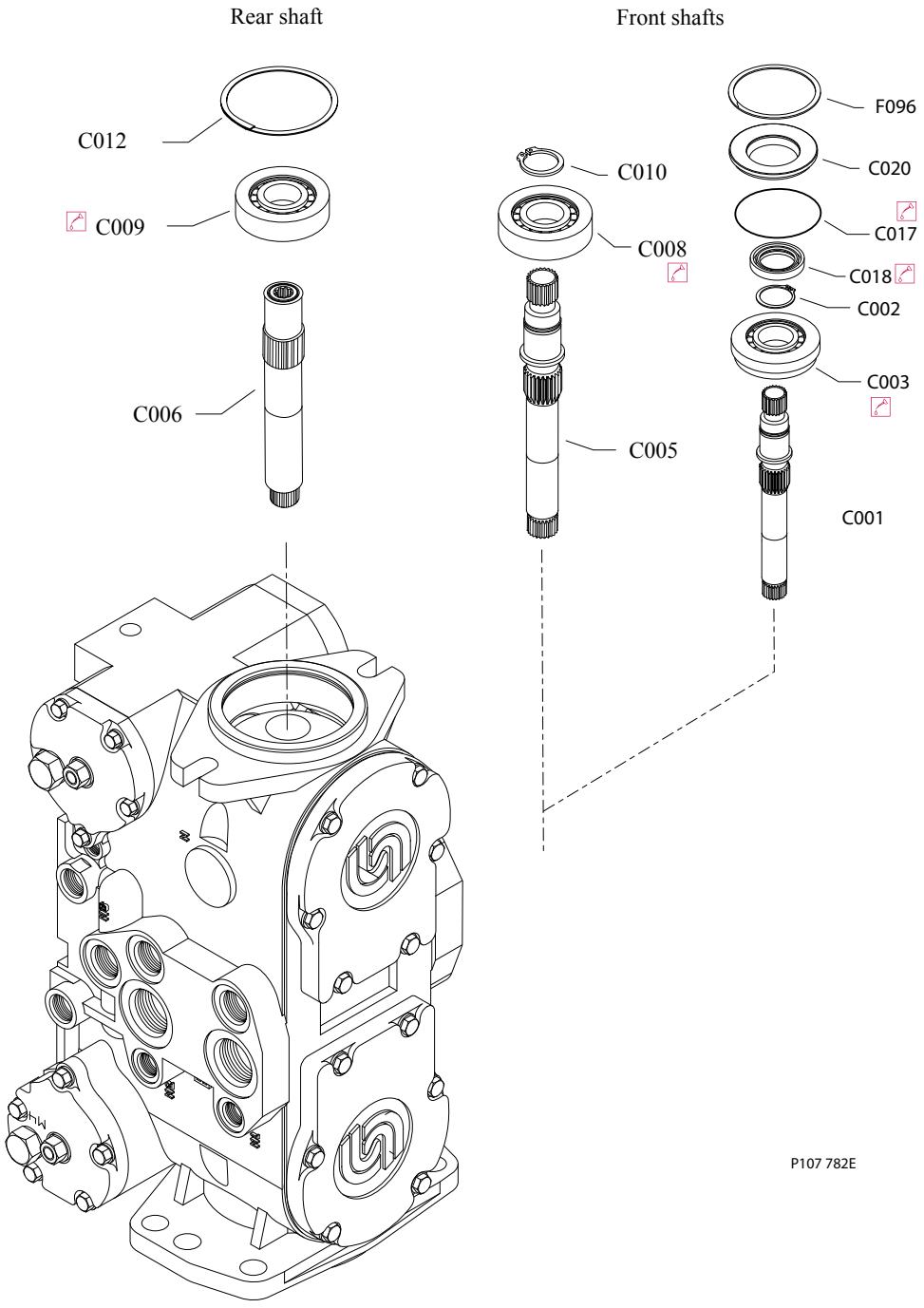
Install front shaft (without seal carrier)

1. Lubricate and install roller bearing (C008).

Minor repair

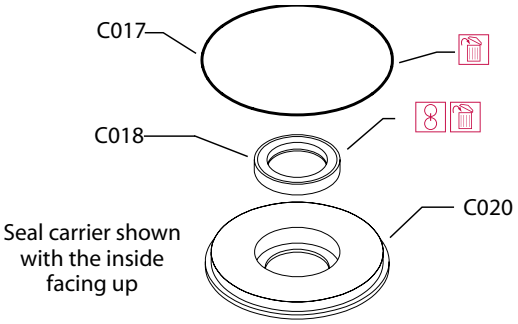
2. Install shaft with bearing into housing. Install retaining ring (C010).

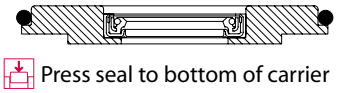
Replace shafts



Minor repair

Seal carrier assembly





P107 783E

Port locations and torque chart

Fastener, plug and port locations and gauge installation

The following table shows the fastener, plug and port locations and gauge sizes needed.

Port information

Port identifier	Port size	Wrench size	Pressure obtained	Gauge size, bar [psi]
L1, L2	1 5/16-12 UNF-2B	15 mm internal hex	Case drain	10 [100]
M1, M2	9/16-18 UNF	7 mm internal hex	System pressure	600 [10,000]
M4, M5	9/16-18 UNF	7 mm internal hex	Servo pressure	50 [1000]

System ports

Port identifier	110 Split flange boss, thread M12 x 1.75
A	1 1/16-12 UN-2B
B	1 1/16-12 UN-2B

Fastener size and torque chart

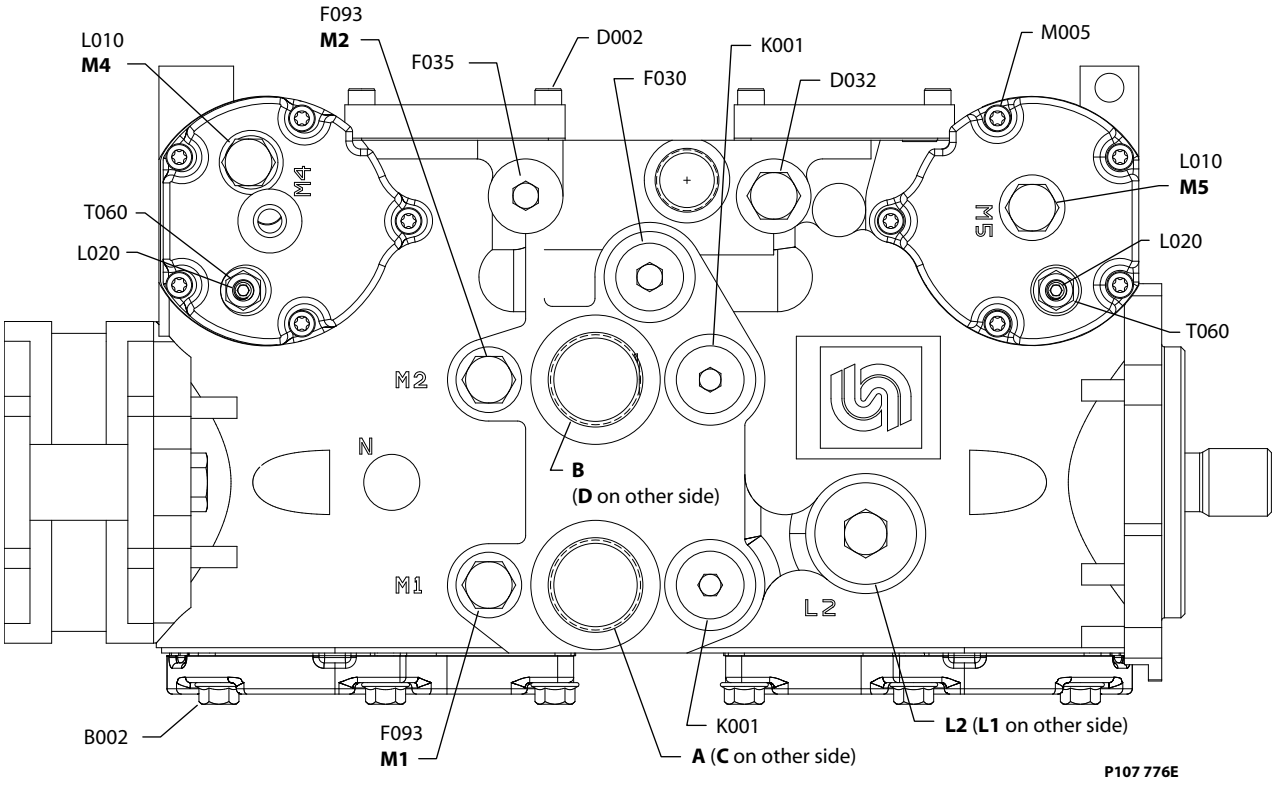
Item	Fastener	Wrench size	Torque
D081	EDC/MDC kit screws (not shown)	1/2 inch	16 N•m [12 lbf•ft]
B002	Side cover screws	13 mm	16 N•m [12 lbf•ft]
D002	Control cover screws	T30 Torx	16 N•m [12 lbf•ft]
L020	Displacement limiter adjustment screws	4 mm	N/A
M005	Servo cover screws	T30 Torx	16 N•m [12 lbf•ft]
T060	Seal nut	13 mm	23 Nm [17 lbf•ft]

Plug size and torque chart

Item	O-ring plug	Wrench size	Torque
D032	3/4-16 UNF	7/8 inch	65 N•m [48 lbf•ft]
D035	3/4-16 UNF	5/16 inch	82 Nm [60 lbf•ft]
F093	9/16-18 UNF	1/4 inch	35 N•m [26 lbf•ft]
L010	9/16-18 UNF	11/16 inch	35 N•m [26 lbf•ft]
K001	3/4-16 UNF	1 inch or 8 mm internal hex	82 Nm [60 lbf•ft]
F030	3/4-16 UNF	7/8 inch	65 N•m [48 lbf•ft]
F035	3/4-16 UNF	6 mm internal hex	82 Nm [60 lbf•ft]

Port locations and torque chart

Fastener, plug and Port locations



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